cooperate to minimize or eliminate exhaust emissions. Claim 20 therefore properly defines a Diesel engine (whose basic operation and components needed for its operation are well known) in connection with an exhaust gas cleaning system and a control unit for controlling the operation of both, the Diesel engine and the exhaust gas purification system.

Reconsideration of the Examiner's rejection of claims 20 – 23 under 35 USC 112, second paragraph, is therefore respectfully requested.

The control unit in accordance with claim 1 is designed to control, on the basis of values provided by a sensor arrangement, a regeneration of the nitrogen oxide store and of the particle filter at exhaust gas temperatures of 400°C to 700°C in such a way that, in a combination of a sulfur regeneration of the nitrogen oxide store, wherein sulfur is released from the nitrogen oxide store, and a soot regeneration of the particle filter, wherein soot is burned off in the particle filter, is obtained in certain defined ways.

It is defined that the control unit is designed to cause the system to execute certain steps required to perform in connection with the Diesel engine certain functions and it is therefore asserted that the specification ought to be considered to be enabling:

The procedures used for cleaning the exhaust gas from a Diesel engine are disclosed in the specification – page 4, line 26 – and how a Diesel engine operates and what components are needed generally for its operation is certainly well-known and does not need to be described.

However, it is noted once more that today's low emissions Diesel engines are tightly interconnected with the exhaust systems and both need to work together so that the two parts cannot be considered separately that is a claim directed only to the Diesel engine or only to the exhaust system would fall short of considering the actual circumstances. As far as the functions of a Diesel engine are needed for the inventive concept submitted in the present application they are referred to in the claims. Features relating to the engine part are defined in subclaims 21 -23. Features relating to the exhaust gas treatment part are covered by claims 24 – 27.

Reconsideration of the Examiner's rejection of claims 20 – 27 under 35 USC 112, first paragraph is respectfully requested.

The Examiner has further rejected claims 20 – 23 and 25 under 35 USC 102(e) as being anticipated by Khair et al. (US 6 293 096) and he has rejected claims 24 and 26 -27 under 35

USC 103(a) as being unpatentable over Khair et al. in view of Held (US 6 531 099 B1) and in view WO 00/21647.

Khair et al. (US 6 293 096) discloses an exhaust gas treatment systems for a Diesel engine with a control unit for controlling the Diesel engine as well as the operation of the exhaust gas purification system. The exhaust gas treatment system comprises a particle filter a nitrogen oxide storage device arranged upstream of the particle filter, an oxidation catalytic converter arranged upstream of the nitrogen storage device and a sensor arrangement for determining the operating state of the exhaust gas purification for determining the operating state of the exhaust gas purification arrangement and, wherein, via the control unit, the regeneration processes occurring in the purification arrangement, that is in the nitrogen oxide storage device and in the particle filter can be controlled.

Khair et al. describes a regeneration procedure for the nitrogen oxide storage device which is known to the person skilled in the art as "Nitrate regeneration", wherein the nitrogen oxide stored in the storage device as nitrate is reduced by reaction with a reducing agent so as to form harmless inert nitrogen.

As reduction mediums suitable and used herefor carbon containing particles and excess hydrocarbons contained in the exhaust gas are mentioned (col. 2, line 25 – 33; col. 4, lines 43 – 55, equation (2). For performing this nitrogen regeneration, additionally hydrocarbons are injected into the exhaust gas via an injector (col. 4, lines 57 – 60).

For the regeneration of the particle filter Khair et al. causes an oxidation of carbon, or respectively, soot (C) with nitrogen dioxide (NO_2) and bypassed NO_2 which then reaches the carbon trap oxidizer where the NO_2 is reduced to N_2 and the carbon is oxidized to CO_2.

In Khair et al., the Nitrogen regeneration as well as the particle filter regeneration with NO_2 are, as is well-known, processes which occur with the comparably low exhaust gas temperatures of 250° to 350°C normally present in Diesel engines. Consequently, in the exhaust gas cleaning arrangement described in Khair et al. higher temperature of up to 700°C are not necessary and also not desirable and, accordingly not provided.

The Diesel engine with exhaust gas purification according to claim 20 differs from that of Khair et al. in that:

i) it relates to a regeneration procedure on the basis of a higher temperature of 400°C to 700°C which also includes a sulfur regeneration of the nitrogen oxide

storage device with the release of sulfur deposited in the nitrogen oxide storage device as well as a soot regeneration of the particle filter by burning off of the soot collected in the particle filter;

ii) it resides in a combination of a sulfur regeneration and a soot regeneration in such a way that a) sulfur regeneration and soot regeneration occur directly one after the other or b) by switching of process parameters a sulfur generation is performed intermittently at intervals during a soot regeneration or c) a soot regeneration is performed intermittently at intervals during a soot regeneration.

Concerning i): The sulfur regeneration of the nitrogen storage device as claimed in claim 1 as neither disclosed in Khair et al. nor is it obvious therefrom. It is rather noted in Khair et al. (Col. 5, lines 50 – 52) that a sulfur poisoning of catalysts and, as a result, the nitrogen oxide storage device should be avoided by the use of low-sulfur fuels. And when sulfur poisoning of the catalyst is avoided, a sulfur-regeneration is logically not necessary. Consequently, no hint is provided in US 6 293 096 that the system disclosed therein can provide for a sulfur regeneration of the NO_x storage device.

The Examiner's allegation under "Response to Arguments" page 7/8, that the Khair et al. NO_x adsorber is the same as that of Murachi et al. (US 5 746 989) and that therefore the exhaust gas purification arrangement of Khair et al. provides for a sulfur regeneration in the same way as Murachi et al. is not founded and is based on incorrect assumptions. It is already obvious from the object of the Khair et al. that the arrangement of Murachi et al. is in some ways considered to be disadvantageous and should be operated differently (col. 2, paragraph 1).

The Examiner's allegation that Khair et al. discloses in connection with the NO_x regeneration also the use of increased temperatures resulting in the release of sulfur which was also absorbed in the NO_x storage device (or trap) (page 4 of the Official Action) is not correct. No indication to this end is provided in the passages cited by the Examiner or at any other location. It may be correct that, with the fuel injected into the exhaust gas for short periods, the temperature in the nitrogen oxide storage device may be increased for a short period – although this is not said in Khair et al. (also not in the passages of col. 2, lines 25 – 38 and 55 – 65 cited by the Examiner). Since however the period for the injection of fuel for an NO_x regeneration is very much shorter than the period during which the NO_x storage device stores NO_x under lean exhaust gas conditions (see page 6, line 21 – 27 of the present application) a temperature in-

crease to the temperature needed for sulfur regeneration is not possible in principle, so that the Examiner's allegation that NO_x and sulfur are released in Khair et al. is not correct.

Furthermore, Khair et al. does not include any reference to a soot regeneration of the particle filter at increased temperatures of 400°C to 700°C. The passage referred to by the Examiner (col. 5, line 42 – 50) concerns the known effect that at, high engine load and high engine speed, a relatively large amount of NO_x is generated as a result of the relatively high combustion temperatures in the engine. Khair et al. utilizes a correlation of exhaust gas temperature and engine temperature for obtaining an indication concerning the NO_x content in the exhaust gas. There is no basis whatsoever for the Examiner's allegation that an exhaust gas temperature of 400°C to 700°C is obtained causing the release of sulfur from the nitrogen oxide storage device.

Concerning ii)

Since in Khair et al., no sulfur regeneration occurs (see above) such a regeneration cannot be provided for in connection with a particle filter regeneration either. As far as in the method disclosed by Khair et al., a combination of regenerations can be considered, this concerns a nitrate regeneration with an incomplete reduction of nitrogen oxides, that is, with a passing on of a certain amount of NO_2 (Col. 4, line 60 – 64) intended to facilitate a conversion of soot in accordance with the equation (3).

It is believed that, upon reconsideration of his rejection of claim 20 in the light of the above comments – which is respectfully requested – the Examiner will agree that claim 20 is neither anticipated by Khair et al. nor in any way obvious therefrom, that is, it ought to be considered to be patentable in the light of the cited references.

The references do not disclose, neither alone nor in combination, a regeneration of the nitrogen oxide store and of the particle filter at exhaust gas temperatures of 400°C to 700°C in such a way that, in a combination of a sulfur regeneration of the nitrogen oxide store, wherein sulfur deposited in the nitrogen oxide store is released, with a soot regeneration of the particle filter, wherein soot collected in the particle filter is burned off, is provided for by either

a) the sulfur regeneration of the nitrogen oxide store being immediately by the soot regeneration of the particle filter,

b) the switching of the process parameters in such a way that the sulfur regeneration of the nitrogen oxide store is initiated intermittently during the soot regeneration of the particle filter, or

c) the soot regeneration of the particle filter is initiated intermittently during the sulfur regeneration of the nitrogen oxide store.

Claims 21 to 27 relate to particular features considered to be advantageous in connection with the Diesel engine as defined in claim 20. These claims are all dependent on claim 20 so that they include all the features of claim 20 and, therefore, should be considered to be patentable already for that reason.

Additionally, it is noted that claim 24 concerns a Diesel engine according to claim 20 wherein, downstream of the particle filter, a lambda sensor is arranged in the exhaust system. In connection with this claim, the Examiner has cited US 6 531 099 B1 (Held) which discloses an exhaust gas purification arrangement with a nitrogen oxide store and a lambda sensor arranged <u>upstream</u> thereof. No particle filter is provided. No suggestions or motivation can be derived from either Khair et al. nor from Held to provide a lambda sensor downstream of a particle filter. A combination of the respective devices as suggested by the Examiner may possibly result in an exhaust gas purification arrangement with a nitrogen oxide store and a particle filter arranged downstream thereof wherein however the lambda sensor would be disposed upstream of the nitrogen oxide store and, consequently upstream of the particle filter – contrary to the Examiner's allegation on pages 5/6 of the Official Action. A combination of the teachings of Held and Khair et al. can therefore not load to the arrangement as defined in claim 24.

Reconsideration of the present application is respectfully requested and allowance of claims 20 to 27 is solicited.

Respectfully submitted,

K. Bach

Klaus J. Bach, Reg. No. 26832